1:Spier E-5 (1918) 1928
NT14 Plateau Yumans NT14
Havasupai

133 mesaal, yucca, and a sparse scrub growth. Still higher is the plateau:
137 at the lower elevations this is covered with sagebrush, chamisa, etc.; at a higher level grow juniper, cedar, and piñon trees; and at the Grand Canyon rim and toward the mountains are pines, spruce, and fir. Water is very scarce on the plateau; springs are found chiefly near the mountains, elsewhere the surface run-off of summer rains and melting snows may be caught behind little dams.

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[131]

Fig. 1. Territory of the Havasupai.

132 Precipitation is confined to two periods, the heavy summer rains (July to early October) and the winter snowfall (December and January). Its distribution varies from five to fifteen inches per annum over the greater part of the range to a maximum of twenty-five inches near the mountains in the south. The rains are sudden and torrential and the
132 run-off excessive, the accumulated waters rushing into the lower canyon
731 and producing dangerous flood conditions. I witnessed an unheralded cloudburst in August, 1918, when all the heights spurted torrents upon the village below. Everyone fled to the cliffs; the swollen creek swept

[Text continues on p. 94]

1:Spier E-5 (1918) 1928
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away houses and destroyed fields. For a week, during which further storms threatened, no one made more than trifling efforts to restore things to their former condition. The severest flood of recent years was that of January, 1911, when a heavy rain brought down the accumulated snows from the plateau, filling the canyon bed quite to the talus slopes, tearing away a third of the field area, and on its subsidence leaving the creek in a new location.

The prevailing winds are from the southwest. These blow hardest and are most annoying in the spring, on account of dust storms. The temperature on the plateau varies from a midwinter mean of 30° F. to 70° F. in midsummer; that in the canyon is about ten degrees higher the year round. There is sometimes as much as a foot of snow in the canyon bottom, yet snowfalls are infrequent. Despite the fact that it is warmer in the canyon, the Havasupai prefer to spend the winter on the plateau, partly because it is less humid there, but rather more because there is an adequate supply of good firewood, and chiefly because their interest lies in the hunting, seed gathering, and visiting activities of this season.

Beside the village in Cataract Canyon, the Indian Gardens (*hatsdiwâ'*, coyote tail?) on Bright Angel trail below Grand Canyon station, and perhaps some similar farm lands elsewhere, as at Prospect Valley, the Havasupai consider a large section of the plateau as their proper range. Its limits are approximately as follows. On the north, the benches on the south side of the Grand Canyon, the Buckskin Mountains, and Powell's Plateau: on the east, perhaps Coconino Basin and the plateau west of it; Hawalgâti'dâ, a spring perhaps east of Black Tank, and Pŏkâdcspal'îvâ, near Hull Spring (Cedar Ranch) north of the San Francisco peaks, with the whole northern and western slopes of those mountains: on the south, Red Lake at the head of Cataract Canyon, Black (or Kisaha) tank (*hdwaiptsâ'*) north of Seligman, Howard Spring (*nalîtsâd*), and at least in recent times they hunted in the vicinity of Ash Fork and perhaps north of the Black Forest. The limits on the west are more difficult to define since they commonly occupied certain localities together with the Walapai, for example, Pine Spring (*hakâsa*, where there were also Paiute living with them about 1880), and Mohe Canyon at the northern end of the Aubrey Cliffs. Beyond these points the Havasupai consider themselves well out of their own territory. Prospect Valley and Pine Spring formerly belonged to the Havasupai alone, the Walapai subsequently crowding them out.

It would seem that beyond this range, at least on all save the western side, there was considerable unoccupied territory. Paiute settlements

Sailiff Y-5 (ca. 1901) 1964 NT14 Plateau Yumans NT14
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Later, I went out to have a look at the cottonwood tree that held the thermometer. It hugged the wall of the house, spreading heavy branches over the roof. A few years afterward, this tree became very important to one of my successors. He and his wife saved their lives by climbing as high as its creaking limbs would allow while a flood raged below.

A short ladder leaned against the gnarled trunk. By standing with one foot on its top rung, the other on a stout limb, I would be able to read the thermometer that was enclosed in a rectangular box, nailed to the tree's trunk. I had played in trees in my childhood; tree climbing had always been fun. But now, when I tried to picture myself in my ankle-length skirts perched on a rung of the ladder and a limb of the tree, peering into that box, I couldn't bring the picture into focus; I didn't want to. But that didn't keep me from taking the readings and sending the reports to Washington. The canyon's temperature, I learned, varied by ten degrees from that of the mesa, winter or summer. Even nature applied a special law to the land of the People of the Blue Water.

Mr. Ewing had been right about our isolation. I was soon hungry for news from the outside. Our mail was brought by Indian carrier from Seligman, and this was "mail day." We were so eager for letters that by the time the sun's rays had left the canyon at three o'clock, we were already watching the trail, hoping the carrier had made a faster trip than usual. However, we had lighted the lamps before Spoonhead came riding in with the mail-sack thrown across his saddle.

It was the first time I had seen Spoonhead, but I did not need to speculate as to the origin of his name; just as the Indians declared, his head was shaped like the bowl of a spoon.

Miss Goenawein kept the post office in one corner of her room. She sorted the mail while we waited. Among my letters was one from Mr. Ewing, asking me to prepare an annual report for the Commissioner of Indian Affairs covering conditions on the reservation for the past year, a duty neglected by my predecessor. It was long overdue, and he urged that I submit it immediately. Although

Zolliff Y-5 (ca. 1901) 1954 NT14 Plateau Yumans NT14
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These Indians apparently had no knowledge of 273
peyote. There was no intoxicating liquor of any kind on the
reservation. I was beginning to realise that, on the surface, life in 000
this canyon might be like living among children, except when
savage tempers were aroused—and then? Well, I had asked for
adventure.

I still did not know what to write in that annual report.

The school session had been interrupted by the departure of 224
the former superintendent. Vacation, at this school, came in the 222.
fall, when the entire tribe made an exodus to the mesa to hunt
game and to gather wild seeds and plants, so I planned to open
school on Monday morning, asking Vesnor to notify the people
in the village. The following Saturday I would be free to take a 161
census of the tribe and determine the acreage under cultivation. So 311
far, I had no basis whatever from which to work out the report
Mr. Ewing wanted. But by verifying the statement of a former
teacher that there were two hundred fifty Indians in the tribe and
three hundred fifty acres in gardens and orchards, I could incor-
porate his figures in my report to Washington.

Even in summer, the sun did not rise in our part of the canyon 132
until after nine o'clock, so it was still gloomy and damp when I
crossed the grounds to the school building Monday morning. The 133
school plant stood at the head of the stream, the dividing line
between the upper, desert end of the canyon and the lower sec-
tion, a jungle of greenness. Immediately behind our schoolhouse
stood a column of stone about three hundred feet high, partly
detached from the wall by rain and frost. If it fell, it would bury
the schoolhouse beneath tons of rock. The danger seemed immi-
nent as I gazed at the upper end of the column, standing straight
and free. Later, I learned that such columns topple over only
after a flood.

I had rung the warning bell, and it was time for school, but no 812
children had appeared. Then the bushes parted violently and 177
dozens of little Indians burst through on the run. Behind them,
maneuvering his well-trained pony with all the skill of a cattleman
rounding up strays, rode Vesnor. The older pupils followed more

2:Iliff Y-S (ca.1901) 1954 NT14 Plateau Yumans NT14
Havasupai

resting there in the shadowy gorge, where nature rioted and roared; and yet, in the cool, protected place where they slept, there was an inner quietness and soul-resting peace. Reluctantly we turned our mounts back to the trail, leaving the park officials to make their observations at the falls. We did not suspect it then, but later we had reason to believe that their visit resulted in an invasion of the canyon that filled the Indians with terror.

The sun's rays had by now reached us. And the parching waves of heat which the walls reflected filled us with almost unbearable thirst. A large fat dog that we had not been able to prevent following us, crept under bushes or ledges of rock for one precious moment of shade, then ran, panting, to catch up with us. Finally he crawled under a rock and his pitiful moans told us that for him the journey had ended. On our return, we found his body huddled far back under a shelf of stone.

Beaver Canyon, a narrow crack in the terrain over which we were traveling, cut across our path. A short bridge would have spanned it, but when we peered into its depths it seemed bottomless; we made the twenty-mile detour around it. We had had no food since our early breakfast, so after rounding the canyon's head at four o'clock, we dismounted and prepared supper. Ute slid over a steep incline into the gorge, and filled two canteens from a spring. Our fried chicken, hard-boiled eggs, green beans, peaches and cocoa disappeared so rapidly that we were appalled when we discovered that Ute, who had agreed to bring his own food, had only a green watermelon (which he declined to cut) and a few peaches. We shared with him, and he was quite pleased with our contribution. We had yet to learn that an Indian carries a minimum of food and travels long stretches without water.

When we had finally completed the long detour around Beaver Canyon, Ute led us to a "rain tank" and the horses had their first drink since we had left home. Then darkness settled down rapidly and it was time to make camp. While we ate a hasty lunch from a shelf of stone, Ute cut his green watermelon and devoured it noisily in addition to the food we gave to him. He held himself

Sellff Y-S (ca. 1901) 1964 NT14 Plateau Tumans NT14
Havasupai

CHAPTER TWENTY-ONE

Trial by Water

000 Whenever opportunity offered that hot summer, I slipped on an old dress in lieu of the bathing suit I did not have, and took a plunge in the wide pool only a few yards from our cottage. Completely screened by dense bushes and trees lining its banks, I floated lazily across its surface, catching enchanting visions of red walls and blue sky through the overhanging branches. God put something in running water and in trees that rests the soul; this secluded spot had that quieting touch. In its delicious coolness, I forgot the heat that beat back from the walls, the problems, the feuds, even the suffocating air in the crowded classroom. But duty refused to take a holiday, even in soaring temperatures, so the pool gave only momentary relief. One hope was left to us—the summer rains.

132 We knew that Arizona had a rainy season which broke the heat of its long, dry summers, but none of us realized that nature could react with a deluge out of all proportion to the need.

I doubt if anyone except the Indians knew what a flood would do to the canyon and to the houses and gardens on its floor. The Havasupai had an uncanny weather sense. If we had asked them, they would have interpreted the significance of the signs all about us and told us what to expect. But we didn't ask. The Indians must have been convinced that the Hicos knew everything worth knowing or we wouldn't be there trying to teach them, so they didn't bother to instruct us on the means of escaping from a water-filled canyon.

[p. 18.2]

Billiff Y-8 (ca. 1901) 1964 NT14 Plateau Yumans NT14
Havasupai

There was no letup in the heat. It was reflected from the walls in visible waves. Work in the classroom was almost unendurable. Heads nodded sleepily when the hot, still air in the low-ceilinged room became heavy with the smell of campfire smoke and sweat. There had been several sudden, pelting rains that passed quickly, leaving the air momentarily fresh and sweet and a little cooler. Now, we watched our narrow strip of sky for clouds, hoping for another shower. Even the occasional cool breeze that swept through the canyon lost its coolness when it came in contact with our torrid walls, so the nights, too, were hot.

Out under the cottonwood in our front yard, hung a weather-beaten hammock. Night after night Frances and I had tried to sleep in our poorly ventilated, sultry room; so one night I moved out under the tree. I found that making a bed in the tippy contraption was something out of my line, but managed to hold things down until I got in. It was like riding a bucking bronco; the more I struggled to maintain my balance, the more the bed tipped.

The commotion brought faint, squeaking protests from the tree; the small creatures that lived there resented the intrusion. We had amused ourselves many times trying to locate the bats sleeping among the leaves during the day, but I was to have a nocturnal view. At first, a thin squeaking line flew off into the darkness. Then the entire colony rose from the tree, soaring about on kitelike wings, to begin their nocturnal foraging. As if they had held a conference and agreed on the strategy, they swooped down, their bony wings brushing my face and hair. I was outmaneuvered and ran indoors.

The next day was a holiday, dry and hot as any day had been that summer. For a brief space in the afternoon the sunshine grew dim and watery; then, again, hot and bright. A change in weather was impending. We scanned our narrow strip of sky and hoped for one of those refreshing showers. There was only a hazy sky, and now again that peculiar misty sunlight.

Vera, one of the older schoolgirls, had come from the village to make a dress for herself on a school machine, and was hurrying

2:Iliff Y-S (ca.1961) 1964 NT14 Plateau Yumans NT14
[Havasupai

132 to finish before dark. She was nervous about the weather, but wanted the new dress to wear to Sunday school, so went on with her work.

A hot wind blew through the canyon, bending the trees and swirling the sand about in clouds. Then came a breathless stillness. Vera threw her work aside, and ran out of doors. We followed. With a quick glance at the sky, the girl exclaimed, "Very bad storm up there, very bad!" Vera knew the canyon in all of its moods. She was terrified. So were we. Something sinister was brewing and our strip of sky did not tell us what to expect. If only we could see beyond the rim of that high canyon wall! Suddenly masses of black, heavy clouds boiled into view, rolling and tumbling ominously, the lower folds surging violently upward, those above shooting down in writhing, twisting masses. Through the blackness we caught occasional glimpses of a high greenish ceiling. What would the storm bring? If only wind, the walls would protect us; a hurricane could not negotiate so narrow a gorge; but if the clouds were loaded with water, we were in grave danger.

133 The topography of the surrounding country was against us; the plateau sprang, like an open fan, to the south, the east and the west, forming a drainage area of hundreds of square miles which poured its water into our canyon. We didn't realize then that the indentations in the rimrock were old watercourses, which this drainage had cut through the outer limestone walls on its way to our chasm.

132 The stage was set for quick action. The clouds rolled and boiled, but in the canyon there was only stillness pressing down. The big cottonwood leaves hung limp; the dead air warned of disaster. Then again came that inrush of hot air. The tension eased a little when big, misshapen drops hit the ground with vicious spats. The rain had come, but it was an unnatural rain that filled us with awe.

We retreated to the house and stood in the doorway watching the torrential downpour. Suddenly Vera burst into tears.

"Look! Look!" she cried, pointing to the high canyon wall back of the school building.

Sutliff Y-5 (ca. 1901) 1964 NT14 Plateau Yumans NT14
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It was covered from top to bottom by a sheet of water. Vera knew what that meant. The canyon might fill to any depth, depending on the quantity of water that poured over the walls added to the amount that fell in the canyon. She wanted the security her own people could give her; they had weathered countless floods. We realized our helplessness, so put a coat about her shoulders and told her to run to the village. She flew down the trail like a frightened deer. Weather-wise as the Indians were, she may have sensed that a cloudburst or storm of destructive violence was imminent. She had barely time to reach the village when the clouds opened, pouring down water in a solid column.

The entire west wall as far up and down the canyon as we could see was now hidden behind a curtain of water. Then the east wall, only fifty feet away, was likewise hidden—more drainage from the mesa! Those curtains, hundreds of feet high, were pouring tons of water into our gorge each moment. The thundering noise made conversation impossible unless we shouted. The confusion bewildered us. We tried, hurriedly, to plan, but still held to the foolish hope that the water would drain off as fast as it came in.

Then came a new danger—something beyond our imagining. With startling suddenness, a full-grown river, boiling with sand and debris, leaped over the east wall with a force that shot it far out into the canyon and a roar that drowned the noise of the storm. We knew then that the plateau was pouring its accumulated drainage down on us. We realized the volume and strength of the current when a large evergreen tree rode its crest and fell, beaten and crumpled, almost at our feet. Nothing could stand against that roaring waterfall. It hurled a boulder over the rim, spun it crazily and smashed it on the ground with an impact that shook the canyon. Other rivers dropped over the rim. Surely the end was near. How long could the gardens, the houses and the people take such a beating? How long could our building stand? Would the sturdy old cottonwood go down?

Our stream of clear, blue water had disappeared. A maelstrom of dirty suds, tumbling stones along its bottom, swept down the

2:Iliff Y-S (ca. 1901) 1964 NT14 Plateau Yumans NT14
Havasupai

Havasu's bed, spreading across the canyon from wall to wall. Each moment its power was augmented by the increasing drainage from the mesa and by the river that roared down from the upper end of our canyon. We were convinced that the house would go, and could think of only one means of escape—the trails.

We hurriedly decided to try the Lee Canyon trail, fifteen miles long, but not so dangerously steep as the Walapai trail. The rain was coming now in wind-blown sheets. If the trail remained passable, we could reach the mesa. Miss Goenswein and Frances were rushing around preparing to leave, so I put on my raincoat. When we closed the door behind us, we were almost beaten down by the storm; I had the forlorn feeling that this was the end. The mouth of Lee Canyon was a long distance from the school; we would struggle against water and rolling stones just to reach the trail's lower end. After that, the climb to the outside. Any Indian could have told us that boulders and landslides would block both trails; that torrents would tear out their weaker parts, leaving sheer precipices. However, the Indians were looking after themselves; there was not one within sight. Even though the village stood in a wide section of the canyon where the water had room to spread out and would do less damage, the Indians were moving their possessions and their families to places of greater safety.

By keeping to the higher ground in the center of the canyon, we avoided the waterfalls plunging over the rim on either side. The water deepened as the gorge narrowed, but we pushed ahead. Not until we heard the roar did we remember the hazard of the Gap where the passage narrowed to fifty feet, thereby increasing the river's force. The Gap was filled with churning water ten feet deep, thick with mud and tumbling stones. The flood spumed out in front of us, divided into two streams that flanked the center ridge and rolled on to create more havoc below. There was no way to pass this barrier; we stood quite still, staring at it, beaten.

"The Walapai trail!" Francis shouted. "We can't stand here. Stones are cutting my legs."

So we retraced our steps, wading back to the mouth of the

2:11iff Y-5 (ca. 1901) 1954 NT14 Plateau Yumans NT14
Havasupai

Walapai Canyon, and followed the trail to the Corduroy Bridge 132
over which our mounts had stepped so gingerly that July day, weeks before. Here too was a gap, narrower than the one that had just turned us back. The torrent leaped over the bridge to the ground, a fall of thirty feet. It cut off our last chance to escape by the trails. We had traveled in a circle, up to the Gap and back, only to meet defeat. Then Frances began climbing the talus of sand and stone banked at the foot of the canyon wall. Here was safety, within a few yards of our house! The talus took us above the flood water. We still got the full force of the storm, but soaked and bedraggled, we felt intense relief in being safe. Our greatest fear had been of being caught in that current, carried over the tremendous Havasu falls and dumped into the muddy Colorado. From this point, we watched the water plunging down the canyon bed, striking tree trunks, boulders or angled walls and shooting long streamers of spray high into the air. It surged against the buildings, ran up the walls, then fell back heavily. Fearful for their survival, we watched our sturdy cottonwoods twist and bend before the onslaught. If they went down, the buildings would go; the canyon would be swept clean.

Then quite suddenly, we sensed a change in the storm; the rain struck with less force. The clouds rolled away and never before had our strip of sky looked so serene, so blue, so beautiful!

We shivered in our wet clothing while the water subsided, which did not take long due to the sharp incline of the canyon floor. Frances began laughing and crying in hysterical relief. To divert her attention, I said, "Imagine how hungry you'd be, Frances, if we had climbed to the plateau; I didn't bring a thing but the clothes I have on."

"I know I brought food," she said. "I remember thinking we might be gone a long time, so crammed a lot of things that we'd need in my pockets."

She pulled a bunch of hairpins from one pocket and from another a few well-soaked slices of bread. All three of us shouted

132 with laughter, released at once from the numbness of strain and fatigue.

We walked back to the buildings, admitting, with chagrin, that we would have been safer and drier had we never left them.

I took my camera and went out to get pictures of the rivers that still cascaded over the rim in five or six places between the school and the village. They were rapidly diminishing in size, but some of them drained in until late the following day.

731 The Indians' gardens and orchards that had been in the path of the main current were washed out and swept over the falls. The houses that stood on low ground were destroyed; however, the sagacity the Indians had acquired through long and bitter experience with floods enabled them to escape without the loss of a life, and with only minor losses of clothing. Each family had a crevice in the canyon walls that made a safe shelter. Here they set up temporary housekeeping.

I expected the children to appear for school Monday morning half-clothed, but only one pair of pants was missing. Six-year-old Dan, face clean, hair brushed and dripping wet, wore his uniform blouse, shoes and stockings, but no pants. He was a comical sight, but no one laughed.

133 731 The Indians warned us that nature would deal us another blow before we could settle down with our usual feeling of security—which wasn't very secure, after all. Many columns of stone stood out from the parent wall, separated from it by fissures in which water from rain or melting snow collected. Freezing weather turned the water into ice, increasing the pressure which widened the crack. This freezing and thawing, over a period of years, left the column unattached. A flood brought such sections tumbling down. This new danger was almost as exciting as the flood had been. It was always a gamble with us, not with the Indians, as to which section would topple over. The one directly back of the school building leaned out threateningly, but when I asked Bob for his opinion, he shook his head.

"Him no fall yet," he assured me, and since Vesnor agreed, we

3James T-8 (ca.1900) 1903
NT14 Plateau Yumans NT14
Havasupai

we were riding up or down literal stairways cut in the rock, or rounding "Cape Horns," where we held our breath at the dreadful consequences that would ensue were horse or man to slip. Entering Rattlesnake Canyon our whole course was on a shelving slope of rock, over which even experienced horses tread gingerly. At last we came to the bed of the main canyon, and then for five or six miles we journeyed on, in the sand or the gravelly wash, for the stream that flows through this narrow canyon in storm times has no other law than its own wilful force. To-day we ride in one place, to-morrow's storm changes everything. After numberless twinings and twistings, all of which, however, gave a persistent northwesterly direction to our travelling, we came in sight of a score or so of large and fine cotton-wood trees, whose height far surpassed the smaller mesquite, cottonwood, and other trees that line much of the canyon's bed. These large trees told us our journey was practically at an end, for here begins the outpouring of the numberless springs that make the stream we can already hear rushing in its pebbly bed lower down. Without any premonition they spring out in large and small volume at the foot of some of these trees, and the Havasu — the Blue Water — is made. Every few yards adds to the water's volume, for more springs empty their flow into it. The first and only real buildings are the schoolhouse and the homes of the farmer and teachers, and then, at once, begin the small farms of the Havasupais.

Stand on the slope here, where a mass of talus rises from the trail side, so that we can survey the whole of the picturesque scene. Note its setting! Towering walls of regularly laminated red sandstone, though the

3 James T-8 (ca. 1900) 1903
HT14 Plateau Tumans HT14
Havasupai

summer time and thus keep the canyon intensely hot both night and day. The large flow of water and the dense growth of willows and other verdure keep the soil constantly moist, so there is a humidity in the atmosphere which, in hot weather, makes it very oppressive.

This moisture renders the canyon cold in winter, although the thermometer never ranges very low. Snow falls but seldom, and then disappears almost as soon as it lights. In 1898 there was snow that stayed on the ground for several hours, but this was one of the severest winters they have had for many years.

A hundred yards or so below where the springs commence to flow Wallapai Canyon enters from the left. It is similar in appearance to, though narrower than, Havasu (Cataract) Canyon, the walls being of red sandstone, the strata of which are as regular as if laid by masons. A few hundred yards beyond the junction of the two canyons a remarkable piece of Indian engineering is in evidence, showing how the Indians ascend from a lower to an upper platform. There is a drop here in the stratum of some twenty-five or thirty feet, and to overcome this obstacle the Havasupais built a cage with logs which they filled with stones, and then from this stretched rude logs up and across, to which other logs were fastened, thus making a fairly substantial bridge from the lower to the upper stratum over which their horses as well as themselves could safely pass. The trail from this point ascends through tortuous canyons a distance of seven miles to the territory occupied by the Wallapais.

Just below the entrance to Wallapai Canyon a vast mass of talus has fallen, and two hundred yards farther

system on the north and west. From the top of the San Francisco Peaks to the bed of the Colorado River, and within a span of about 60 mi., there is a difference in elevation of roughly 10,000 ft. Elevations on the plateau are between 6000 and 7000 ft., while the Havasupai farmlands lie on the floor of Cataract Canyon at an elevation of 3200 ft. This altitudinal range is accompanied by a change in climate with significant differences in flora and fauna. 198

Geology

The geology of the Grand Canyon, which contains one of the most complete stratigraphic exposures on earth, is a striking feature, but beyond that it is of particular importance in relation to the water supply.

The Coconino Plateau is formed by the Kaibab limestone, which exhibits some karst topography and is extremely pervious. The mountains to the south and east are mainly basalt, being of volcanic origin, and a number of smaller cinder cones dot the landscape. The San Francisco Peaks have no permanent surface streams draining from their slopes, and it has been speculated that subsurface drainage from this area may be one source of the springs which emerge from pervious geologic strata in Cataract Canyon.

The Cataract Canyon drainage system, one of the major tributaries of the Colorado River, drains a region roughly rectangular in shape, approximately 50 mi. wide and some 60 to 70 mi. long, comprising an area of about 3500 sq. mi. Its southern boundary extends from Mt. Floyd and Bill Williams Mountain on the west to the San Francisco Peaks on the east. The area includes a major part of the Coconino Plateau.

Although, in this semiarid climate, the thirsty soil with its struggling plant cover and the underlying pervious limestones of the plateau absorb much of the precipitation, the torrential rains and sudden winter thaws so characteristic of desert country produce flood conditions in the lower canyons, an ever threatening hazard for the Havasupai. [132]

The Cataract Canyon drainage system originates in shallow valleys and deeper arroyos eroding the surface Kaibab limestone. The trellis pattern of arroyos on the plateau channels all run off into two canyons, Lee's and Walapai, which are the major tributaries of Cataract Canyon. The two main horse trails entering Cataract Canyon also follow these two tributaries. [147]

Cataract Canyon is formed by a broad upper gorge defined by the massive Coconino sandstone standing in sheer walls 1000 ft. high. Locally designated the Whitewall (Fig. 1) this prominent cliff has a talus composed of the Hermit shale which gives way to the Esplanade, a broad shelf sloping gently to the rim of the canyon's inner gorge.

193 In January, 1911, the most disastrous flood of historic times funneled
731 melted snow resulting from a sudden thaw on the plateau and higher canyons into the confines of Cataract Canyon. A churning roar from the advancing waters signaled reservation residents, who made a predawn flight to the talus slopes. A wall of water smashed through the village, leveling primitive hogans and stone government buildings alike and sweeping away crops, food [657] stores, and personal possessions. Since that time some measures have been employed by the Office of Indian Affairs, without complete success, to contain the creek in a permanent channel as it flows through the village area.

[321] An irrigation system, installed about 30 years ago, repeatedly has suffered major damage from floods. The Indian Service plans to install new diversion headings and to build three large aqueducts with permanent footings. This is expected to stabilize the present irrigation system and to add a few more acres to land now being farmed (Kelly 1953, 56).

133 About a mile downstream from the village, Havasu Creek tumbles in a
[648] series of waterfalls which attract tourists. The scenic aspect of Cataract Canyon in recent years has become an economic asset and a precipitator of increasing Havasupai-white contacts.

133 Travertine terraces deposited at the crest of a waterfall eventually
311 divert the falls to another location. A severe flood in 1952 destroyed a 50 ft.
731 fall, lowered the creek channel for some distance upstream and rendered useless the irrigation system servicing fields in the vicinity. Additional floods over the next few years further deepened the river channel, washing out adjacent fields and leaving others without water. However, some new gardens are now being planted at lower levels along the stream where land can be reclaimed.

439 Since the two most spectacular waterfalls are beyond the reservation
648 boundary, concern is felt by the Havasupai that their budding tribal-cooperative tourist enterprise may be doomed. Private business interests may be able to bypass the reservation area by providing transportation into the canyon at the falls and establishing tourist accommodations there.

Climate, Plants and Animals

132 Records of a climatological substation operated at Supai for 14 years between 1899 and 1930 reveal a maximum annual precipitation of 13.87 inches and minimum of 4.50 inches, averaging 8.89. Precipitation was highest in February, July and August (Martin and Kincer 1933, Section 25, p. 14).

Temperatures in Cataract Canyon are consistently higher throughout the year than on the plateau. Snow seldom reaches the canyon floor, but freezing occurs in the coldest months. On sunny winter days when canyon air is cool, the warmest areas are southern exposures along the top of the talus

132 slopes where storage granaries were located and where some families occupied caves and rock overhangs until 30 or 40 years ago. The humidity of the canyon makes the comparatively warmer temperatures there less bearable than those on the plateau. This, along with the scarcity of fuel, combined to make the plateau the favored winter abode.
[361]
[221]

137 Botanically, the plateau and the canyon floor represent the extremes within the Sonoran Life Zone. On the plateau, clumps of juniper predominate along with stands of western yellow or ponderosa pine and pinyon pine. Nearer the canyons, trees give way to sagebrush, grasses, yucca and a variety of wild food plants including mescal. Prickly pear, yucca, mescal, and some of the other food plants of the plateau,are also found on the Esplanade and at lower elevations. The change in vegetation is a gradual one from canyon rim to floor, with desert plants predominating at the lower elevations. Acacia and mesquite, Mormon tea, agave, prickly pear and other varieties of cacti, yucca, salt brush, and numerous grasses from which seeds were harvested, are found at elevations a few hundred feet above and below the
[372] canyon floor. Dense willow thickets border Havasu Creek, and this was the predominant fuel plant in the canyon until introduction of the cottonwood as a winter fuel source in early reservation days. Watercress in abundance and many flowering plants grow along the creek bottom and the irrigation ditches. Below the farm area, in places where the stream is impounded behind travertine terraces, cattail and other marsh plants abound, while only a few feet
[276] away the usual desert plants make a sharp contrast. Datura (jimson weed) is scattered everywhere in the canyon's sandy soil; the Havasupai have experimented with it as a narcotic but have rejected it.

133 Reservation farms occupy the canyon floor, which is 1/4 to 1/2 mi. in
361 width. Houses are located on individual farms throughout the area. Fields
312 lie on both sides of the creek, occupying about 140 acres of arable land. Fruit trees, still productive, and scars of abandoned fields mark an area below the village which, until about 20 years ago, was well populated. The canyon floor drops in elevation about 150 ft. from south to north in a distance of approximately 3 mi. in the cultivated area.

487 Cataract Canyon formerly was accessible from three directions by means of a half dozen horse trails and several foot trails which entered the canyon close to the village area. Although these old trails are sometimes used at present, the Havasupai more frequently travel the improved Topocoba and Walapai trails, which are used also for packing tourists and supplies into Supai.

245 Peach trees were introduced prior to 1876 (Whiting n. d., 59), and
177 the similarity of the Havasupai term for them to that of the Hopi demonstrates their Hopi origin (Spier 1946, 124). This refutes a popular notion that John D. Lee, a refugee Mormon, introduced peaches in comparatively recent times. Other orchard crops are pears, apricots, apples, both black and white figs,

The Havasupai

IN Cataract Canyon, within the boundaries of the Grand Canyon National Park, nearly three thousand feet below the land above, live the Havasupai Indians. Hemmed in by towering walls of red sandstone the acreage of their reservation is very small but its fertility, spectacular scenery, and unusual setting as a habitation for man ranks it as one of the most remarkable places in Arizona. 131

The original reservation of 1880 was a tract of land about five miles wide and twelve long surrounding the inhabited part of Cataract Canyon. Two years later the size was reduced to the irregular strip of canyon bottom land extending a mile and a half north and south of the Indian settlement, an area of 518.6 acres. The population is also small. The Indian Bureau census of 1939 shows two hundred thirteen members, a slight increase in recent years. The tribe has probably never numbered more than three hundred. 161 [174]

Cataract Canyon is almost semi-tropical. The high plateaus of the surrounding country have a temperate climate but the village, shut in as it is, averages from ten to twelve degrees warmer the year round. In summer it is very hot, the temperature often reaching one hundred and twelve degrees. 132

Through the canyon's gorge runs Cataract Creek which plunges over precipitous cliffs forming several beautiful waterfalls. Mooney Falls, the largest is nearly two hundred feet high. Passing through miles of limestone formations the water is heavily impregnated with calcium and magnesium carbonates, calcium sulphate, and magnesium chloride. These mineral salts in solution over a period of time, coat everything they touch with a stony deposit and impart a light tinge to the water which imparts a light blue or greenish blue to the creek. Where the water gathers in pools at the foot of the falls, it is a fascinating turquoise color. 133 155

Taking their name from the water of the creek, these Indians have become known as the blue-water people (Havasu, blue or green water; pai, people). 101

The Havasupai speak a language of the Yuman stock, and are closely allied to the Hualapai their near neighbors on the west. They speak a similar language, having a slight variation of dialect. Hualapai, Havasupai, and Yavapai are dialects of a single language which is closely related to Mohave and Yuman. 197

HISTORY

Archaeologists have believed the Havasupai formerly built and occupied villages of a permanent character on the Colorado to the east of the San Francisco Mountains where ruins may be found today. As a result of war with other tribes they abandoned these villages and took refuge in the San Francisco mountains subsequently leaving these for their present home. In Cataract Canyon they found plenty of water, a mild climate, and protection from the raids of more powerful tribes. Recent evidence would seem to show that this is not correct, although the information here given is to be found in Hodge, Handbook of American Indians. 174 [114]

The first written record of the Havasupai dates from 1776 when Padre Francisco Garces, a Spanish mission priest, stopped there. There was little contact of the tribe with the Americans for the next hundred years, except for an occasional visit of trappers, prospectors, and exploring parties. 175

For several years following the establishment of the reservation 175 648

343 plaster. Marks were made on each seal so that the owner could
[423] readily identify it. These high storage chambers always kept the In-
dians' food supply safe from the floods that rushed down the canyon at
times. The summer climate in Cataract Canyon is very hot. The rock
[53] walls absorb the heat of the sun during the day and only a part of
this stored heat is radiated during the night.

252 Most of the tribe live much of the time out-of-doors. The cooking
is done over an open fire and the other household work is performed un-
132 der trees and brush shelters. In winter the sun lingers only six or
361 seven hours between the cliffs, imparting but little heat, and the nights
and mornings are very cold. Because of this and lack of fuel, most of
the tribe leave the canyon during the winter months and live on the
plateau around the head of Topocobya Trail on the east. Here there is
plenty of pine wood for fuel and good grazing for the horses. On the
[343] plateau, the house is a sort of *hogan* of logs and earth, more solid in
construction than in the canyon.

264 In the summer most of the cooking is done out-of-doors and the
[353] meals are served there also. The cooking pots and pans, baskets of
fruit, trays of bread, water bottles, and coffee pot are placed together
[45] on the ground. A large vessel containing ground rock salt always
stands nearby, but very little is used, and practically none at all in
the process of preparing food. The family groups itself about these,
sitting on the ground or on boxes within easy reach of the main dish
of the meal. Sometimes plates and spoons are used, but usually pieces
of meat and vegetables are fished from the stews with the fingers,
twigs, or knives, while mush is scooped up with chunks of bread. Gen-
erally the women and children eat with the men, but when they are
visiting male relatives or friends they usually wait until the men are
through.

252 Cooking utensils are of the simplest kind—cheap tin kettles, lard
415 cans, and tin buckets. Some characteristic Indian utensils are still in
[38] use. A shallow basket woven of willow splints, lined with a coating
which may be red clay, stewed peaches or other sticky substance, is
used for roasting piñon nuts and corn. Hot coals are put in the bas-
kets and shaken around until the nuts or corn are roasted.

[227] The conical shoulder-hung basket is still in use for gathering vege-
252 tables and fruit. The *metate* stone for grinding wheat, corn, acorns,
412 and piñon nuts is extensively used. The *metate* is a flat slab of hard
stone (the *mano*) held in the hands. When not in use the *metate* is
turned upside down with one edge resting on the *mano* to keep it off
the ground. A brush made of mescal leaf fibre is used for cleaning
the *metate*. Stone mortars, and pestles, are used for pounding dried
meat, piñon nuts and corn, also.

177 The Havasupai have adopted the white man's mode of dress. The
291 men wear overalls or corduroy trousers, blue cotton shirts, jumpers
302 large cowboy hats, and boots or shoes. Their hair is cut short. The
women wear long, wide-skirted dresses, which they make themselves,
of calico and print in the brightest colors obtainable. Ten yards is the
usual amount of material required to make a dress. The hair hangs
down in long bangs over the forehead so it almost obscures the eyes.
It is cut shoulder length in back. Their hair dressing is about the
only thing distinctly Indian unless it is the brightly-colored handker-
chief tied loosely about the shoulders. Shoes are of American manu-
facture, a high top, low heel lace shoe for the older women and oxfords
for the girls and young women. Moccasins are sometimes worn by the
older men and women. During the warm weather the women and chil-
dren go barefoot around camp.

291 Formerly both men and women wore moccasins. The man's moc-
casin consisted of two pieces. The sole was made of the thickest part

12: Cushing E-5 (1881) 1882
NT14 Plateau Yumans NT14
Havasupai

The Nation of
THE WILLOWS.
II

500 varieties. Upon this strange desert,
● 132 some sixty-six hundred feet above the level of the sea, considerable rain falls during latter July, August, and September; and with the end of November heavy frosts begin and snows ensue, occurring with greater or less frequency and severity of cold throughout the larger part of the winter. During the
136 latter season, these vast plains, undulations, and forest mesas are filled with game of the nobler sort, such as deer, elk, antelope, and bear; followed by the constant coyote and fox, "the herds and herders of the Ha-va-su-pai," as the Zuñis say. Quite different is the Cata-
133 ract Cañon itself, situated only thirty-five hundred feet above the level of the sea, the occupied portion of which is more than three thousand feet below the surrounding desert, — a veritable perennial oasis, with almost subtropical climate and luxuriance of vegetation, with a clear, cold, never-failing, impetuous stream cleaving its way through the little plain at the bottom of the cañon, the waters of which are strongly impregnated with carbonate of lime.
132 The atmosphere is as moist, warm, and temperate as that of the surrounding waste is arid and extreme. Frosts rarely and snows never visit its little plains, and even the quietest pools along the rushing little river are never fettered
137 by ice. The agave, or century-plant, which nowhere appears on the surrounding plains, reaches almost giant proportions in its valleys, furnishing the
[273] material for the mescal, or *al-aa*, so abundantly prepared by the Ha-va-su-pai, and so well known among the more southern tribes of the territory and of Old Mexico. Apricots ripen in June, peaches in July; corn is gathered and
[262] eaten during both months, and again planted, to ripen during September and
[P. 541B] October.